

## CLAIMS

What is claimed is:

1. A variable capacity rotary compressor, comprising:
  - a casing to form an appearance of the variable capacity rotary compressor;
  - a drive unit to generate a rotating force;
  - a rotating shaft connected at a first end thereof to the drive unit, and rotated by the rotating force transmitted from the drive unit to the rotating shaft;
  - a compressing cylinder through which a second end of the rotating shaft passes;
  - a compressing chamber defined in the compressing cylinder to compress refrigerant therein, with a first refrigerant inlet port provided at a predetermined portion of the compressing chamber to introduce the refrigerant into the compressing chamber; and
  - a capacity control unit to control an operation of the variable capacity rotary compressor so as to allow the rotary compressor to perform one of a normal-mode operation wherein the first refrigerant inlet port is maintained at an open state thereof, and of a variable capacity-mode operation wherein the first refrigerant inlet port is periodically opened and closed.
2. The variable capacity rotary compressor according to claim 1, wherein the capacity control unit comprises:
  - a capacity control member installed to rotate along with the rotating shaft while moving axially along the rotating shaft to allow the rotary compressor to perform one of the normal-mode operation and of the variable capacity-mode operation.
3. The variable capacity rotary compressor according to claim 2, wherein the capacity control unit further comprises:
  - a capacity control cylinder arranged in the variable capacity rotary compressor while axially aligning with the compressing cylinder;

a capacity control chamber defined in the capacity control cylinder so as to receive the capacity control member therein, with a second refrigerant inlet port provided at a predetermined portion of the capacity control chamber to introduce the refrigerant into the capacity control chamber; and

a partition plate to partition the capacity control chamber from the compressing chamber, with the first refrigerant inlet port provided at a predetermined portion of the partition plate.

4. The variable capacity rotary compressor according to claim 3, wherein the capacity control member has a cylindrical shape, and comprises:

a communicating depression formed along a circumferential surface of the capacity control member within a predetermined range to allow the first and second refrigerant inlet ports to be periodically opened and communicate with each other during the variable capacity-mode operation.

5. The variable capacity rotary compressor according to claim 2, further comprising:

a three-way valve to feed one of the refrigerant under a high pressure and the refrigerant under a low pressure into the capacity control chamber to allow the capacity control member to axially move in either a first direction or a second direction within the capacity control chamber in accordance with the refrigerant being feed into the capacity control chamber under the high pressure or the low pressure.

6. The variable capacity rotary compressor according to claim 5, further comprising:

a refrigerant outlet pipe connected to the casing so as to discharge the compressed refrigerant from the casing to an outside; and

a refrigerant inlet pipe connected to the second refrigerant inlet port so as to introduce the refrigerant to be compressed into the casing;

a high-pressure refrigerant supply pipe branching from the refrigerant outlet pipe and connected to the three-way valve ;

a low-pressure refrigerant supply pipe branching from the refrigerant inlet pipe and connected to the three-way valve; and

a capacity control pipe extending to the capacity control chamber and connected to the three-way valve

wherein the three-way valve feeds one of the refrigerant under the high pressure fed through the high-pressure refrigerant supply pipe and the refrigerant under the low pressure fed through the low-pressure refrigerant supply pipe into the capacity control chamber through the capacity control pipe to allow the capacity control member to axially move within the capacity control chamber.

7. The variable capacity rotary compressor according to claim 2, further comprising:  
a guide groove;

a shaft hole formed in the capacity control member so as to allow the rotating shaft to pass through the capacity control member, with the guide groove axially formed along an inner surface of the shaft hole so as to transmit the rotating force of the rotating shaft to the capacity control member; and

a guide rib axially formed along an outer surface of the rotating shaft so as to engage with the guide groove of the capacity control member.

8. A variable capacity rotary compressor, comprising:

a compressing cylinder with a compressing chamber defined therein to compress refrigerant therein;

a rotating shaft having one end thereof passing through the compressing cylinder;

a refrigerant inlet port provided at a predetermined portion of the compressing chamber to introduce the refrigerant into the compressing chamber; and

a capacity control unit to control the variable capacity rotary compressor to operate in one of a normal-mode operation and a variable capacity-mode operation such that, in the normal-mode operation, the refrigerant inlet port is maintained in an open state, and, in the variable capacity-mode operation, the refrigerant inlet port is alternately opened and closed.

9. A variable capacity rotary compressor, comprising:

a compressing cylinder with a compressing chamber defined therein to compress refrigerant therein, and including an inlet port provided at a predetermined portion of the compressing chamber to introduce the refrigerant into the compressing chamber; and

a capacity control unit to control the variable capacity rotary compressor to operate in one of a normal-mode operation and a variable capacity-mode operation such that, in the normal-mode operation, the refrigerant inlet port is maintained in an open state, and, in the variable capacity-mode operation, the refrigerant inlet port is alternately opened and closed.

10. A variable capacity rotary compressor, comprising:

a compression unit to compress refrigerant therein and including one inlet port provided thereat to introduce the refrigerant into the compression unit; and

a capacity control unit to operate in a plurality of operational modes such that, in a first of the operational modes, the one inlet port is maintained in an open state, and, in a second of the operational modes, the one inlet port is alternately opened and closed according to a variable capacity of the variable capacity rotary compressor.

11. The variable capacity rotary compressor according to claim 10, wherein:

the compression unit comprises:

a rotating shaft rotating in the compression unit and allowing a compression of the refrigerant;

the capacity control unit comprises:

a capacity control member rotating along with the rotating shaft while moving axially along the rotating shaft to allow the variable capacity rotary compressor to operation in at least the first operational mode or second operational mode in accordance with the refrigerant being feed into the capacity control chamber unit at a selected pressure level.

12. The variable capacity rotary compressor according to claim 11, wherein the capacity control unit further comprises:

a capacity control chamber disposed to align with the compression unit so as to receive the capacity control member therein, with a further inlet port provided at a predetermined portion of the capacity control chamber to introduce the refrigerant into the capacity control chamber; and

a partition to partition the capacity control chamber from the compression unit, with the one inlet port provided at a predetermined portion of the partition.

13. The variable capacity rotary compressor according to claim 12, wherein the capacity control member has a cylindrical shape, and comprises:

a depression formed along a surface of the capacity control member within a predetermined range to allow the one inlet port and the further inlet port to periodically open and communicate with each other during the second operational mode.

14. The variable capacity rotary compressor according to claim 12, further comprising:

a three-way valve to introduce the refrigerant under one of a high pressure and a low pressure into the capacity control chamber to allow the capacity control member to axially move within the capacity control chamber in accordance with the refrigerant being feed into the capacity control chamber under the high pressure or the low pressure.

15. The variable capacity rotary compressor according to claim 14, further comprising:

an outlet pipe to discharge the compressed refrigerant to an outside; and

an inlet pipe connected to the further inlet port so as to introduce the refrigerant to be compressed into the compression unit;

a high-pressure supply pipe branching from the outlet pipe and connected to the three-way valve;

a low-pressure refrigerant supply pipe branching from the inlet pipe and connected to the three-way valve; and

a capacity control pipe extending to the capacity control chamber and connected to the three-way valve, wherein the three-way valve feeds the refrigerant under one of the high pressure from the high-pressure supply pipe and the low pressure from the low-pressure supply pipe into the capacity control chamber through the capacity control pipe to allow the capacity control member to axially move within the capacity control chamber.

16. The variable capacity rotary compressor according to claim 11, further comprising:

a guide groove;

a shaft hole formed in the capacity control member so as to allow the rotating shaft to pass through the capacity control member, with the guide groove axially formed along an inner surface of the shaft hole so as to transmit a rotating force from the rotating shaft to the capacity control member; and

a guide rib axially formed along an outer surface of the rotating shaft so as to engage with the guide groove of the capacity control member.

17. The variable capacity rotary compressor according to claim 10, wherein the compressing unit comprises:

a compressing cylinder defining a compressing chamber therein to compress the refrigerant;

a rotating shaft rotatably disposed in the compressing chamber with an eccentric part to allow the compression of the refrigerant;

a roller fitted over the eccentric part of the rotating shaft, the roller being eccentrically rotated in the compressing chamber by the rotating shaft and compressing the refrigerant in the compressing chamber, and

a vane disposed at an inner surface of the compressing cylinder to divide the compressing chamber into two chamber parts.

18. The variable capacity rotary compressor according to claim 17, wherein the two chamber parts comprises:

a suction chamber part into which the refrigerant is sucked and a compressing chamber part in which the refrigerant is compressed.

19. The variable capacity rotary compressor according to claim 10, wherein, in the second of the plural operational modes, the one inlet port is periodically opened and closed so as to periodically stop an introduction of the refrigerant into the compressing unit.

20. The variable capacity rotary compressor according to claim 10, wherein:  
the compression unit comprises:

a rotating shaft rotating in the compression unit and allowing a compression of the refrigerant;

the capacity control unit comprises:

a capacity control member movably fitted over the rotating shaft to axially move along a length of the rotating shaft according to a pressure level of the refrigerant introduced into the capacity control unit.

21. The variable capacity rotary compressor according to claim 20, wherein the capacity control member is both rotated and axially moved within the capacity control unit in response to the refrigerant under either a first pressure level or a second pressure level, different from the first pressure level, being introduced into the capacity control unit.

22. The variable capacity rotary compressor according to claim 21, one of the plural operational modes is selectable according to one of the first and second pressure levels introduced into the capacity control unit.

23. The variable capacity rotary compressor according to claim 12, wherein the capacity control member has a cylindrical shape and is horizontally stepped at a predetermined portion thereof.

24. The variable capacity rotary compressor according to claim 23, wherein the horizontally stepped portion of the capacity control member provides a flow path formed along a circumferential surface of the capacity control member to selectively open the one inlet port and the further inlet port and to allow the one inlet port and the further inlet port to communicate with each other, in accordance with a rotation angle of the capacity control member.

25. The variable capacity rotary compressor according to claim 23, wherein the horizontally stepped portion of the capacity control member provides a flow path defined thereby to allow the one inlet port and the further inlet port to communicate with each other, in accordance with a rotation angle of the capacity control member.

26. The variable capacity rotary compressor according to claim 25, wherein the stepped portion of the capacity control member provides is formed along a circumferential surface within an angular range of 180°.

27. The variable capacity rotary compressor according to claim 26, wherein a first amount of the refrigerant introduced into the compressing unit during the second operational mode, is reduced compared to a second amount of the refrigerant introduced into the compressing unit during the first operational mode.

28. The variable capacity rotary compressor according to claim 27, wherein the second amount of the refrigerant introduced into the compressing unit is substantially half that of the first amount of the refrigerant introduced into the compressing unit.

29. The variable capacity rotary compressor according to claim 21, further comprising:

a partition plate disposed between the capacity control unit and the compression unit to partition the capacity control unit and the compression unit,



wherein the capacity control member is rotated at a position spaced apart from the partition plate by a predetermined gap, when the refrigerant under the first pressure level is introduced into the capacity control unit, and the capacity control member is axially moved toward the partition plate to be adjacent to and contacting with the partition plate, when the refrigerant under the second pressure level is introduced into the capacity control unit.

30. The variable capacity rotary compressor according to claim 29, further comprising:

a further inlet port provided at a predetermined portion of the capacity control unit to introduce the refrigerant into the capacity control unit; and

wherein, when the capacity control member is spaced apart from the partition plate by a predetermined gap, the one inlet port and the further inlet port communicate with each other through the predetermined gap between the capacity control member and the partition plate such that the refrigerant is continuously fed into the compressing unit.

31. The variable capacity rotary compressor according to claim 29, further comprising:

a further inlet port provided at a predetermined portion of the capacity control unit to introduce the refrigerant into the capacity control unit; and

wherein, when the capacity control member is adjacent to and contacting with the partition plate the one inlet port and the further inlet port selectively communicate with each other according to a rotation angle of the capacity control member.

32. A variable capacity rotary compressor, comprising:

a chamber defined therein to compress refrigerant therein and including an inlet port provided thereat to introduce the refrigerant into the chamber; and

a capacity control unit to operate in a plurality of operational modes such that, in a first of the operational modes, the inlet port is maintained in an open state, and, in a second of the operational modes, the inlet port is alternately opened and closed according to a determined capacity.

33. A variable capacity rotary compressor, comprising:
- a compression unit to compress refrigerant therein, including an inlet port provided thereat to introduce the refrigerant into the compression unit; and
  - a capacity control unit to operate in a plurality of operational modes such that, in a first of the operational modes, the inlet port is maintained in an open state, and, in a second of the operational modes, the inlet port is alternately opened and closed to reduce an electric power loss of the variable capacity rotary compressor, when a capacity of the variable capacity rotary compressor is reducible.